

## The effect of various water application Strategies on clad-ode development of *Opuntia ficus-indica*

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### ABSTRACT

This study aimed at determining the influence of different water applications on clad-ode development of *Opuntia Ficus indica*, a test has been performed in Research Station of Agricultural Research Centre of Ilam Province during 2008-2010. In this research the different irrigation treatments have been studied in three replications for some of the agricultural features of this plant (7 days once, 15 days once, 30 days once from beginning of Khordad). The features studied were the numbers of new pads on mother pad (overall number of pads), the numbers of merged pads on any pad, length and width of pad, the wet and dry function. The results suggested that in the first year the irrigation treatment exposed a significant difference in the most features, in a manner which in the first year the best treatment was the normal irrigation treatment 7 days once for all features, but since it isn't economical, this treatment as deleted from the advised treatment list. Because of being small and non-economical the amount of wet and dry forage wasn't accounted in the first year. After normal irrigation and the irrigation in 15 days once allocate the best performance of wet and dry irrigation treatment; in the second year respectively 35.16 tones per hectare and 3.67 tones per hectare. Due to the weak and insufficient structure and tissue of the studied soil, we certainly can gain a overstated performance in 15 days once irrigation in this study.

**KEY WORDS:** Forage Cactus, Irrigation, Dry yield, Wet yield.

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### INTRODUCTION

The pasture grazing with a three times producing capacity, not only is the cause of weakness and overthrow of the plant and forage reduction-resulting the protein and diary decreasing- but also follows the soil erosion and water waste and its consequences (Heidari Sharaf Abad, Torknejad 2000). After Second World War, around 50 % of dry and semi-dry grazing lost their plant covering because of population reduction. During 1950 \_1989, the ship population rose to 1% from 25% per hectare. The amount of grazing influence and its aim at herbivorous animals' feeding decreased to 20% from 80% in 3-4 decade ago. (Nefzaoui and Salam, 2001). For their high efficiency compared with Grasses and Legumes in changing into dry material, alternative production of forage and other economical crop, forage Cactuses can solve this problem. Forage Cactus can be produced up to 100 tones per hectare in the area with a rainfall of 150,200 and 400mm. cactus has been raised for forage in brazil for 400 000 hectares (monjauze and Houerou, 1965, nefzaoui and salam, 2001) and in North Africa (Tuness, Algeria and Morocco) from 700 000 to 1 million hectares (Domingues, 1993; Dos Santos and de Albuquerque, 2001). in other hand, drought is one of the natural and common feature of lands and dry climates. Agricultural drought means the rainfall reduction compared with the average (annual).

This drought seriously harms the crops in several months and even years, and it may be spread over a wide geographic region. Drought mustn't be mistaken with dryness.

Dryness means the durable average relation between rainfall and evaporation rate. This kind of dryness occurs just in non-sterile lands. The serious and season drought usually take place in these regions. Because of forage reduction, a large amount of herbivorous animals may die and diary products are lost too.

The most frequent features of forage cactus are; the high capacity of transforming water to dry material (Han and Felker, 1997 Nobel, 1991, 1994), the extraordinary producing of dry materials with high quality in water- limited regions (Felker and Paterson, 2006). During dry period, while other plants have been brown and pale because of hotness and dryness, the only resource of Vitamin A is Cactus.

The noticeable point about Cactus is that the high humid content of Cactus is an efficient feature because it satisfies the need of animals' need to water. (Guevara et al. 2003) cactuses are thorny and thornless ones. There are also the gastronomic ones among species. Burned their thorns, these species are eaten by herbivorous animals. The scorching machines usually do this task. (Havez Ramirez et al., 1997) viewing the above features and the fact that forage Cactuses can be efficient forage resources for hot and dry region of country – specially the low-efficient grazing and margin fields. Because of their particular tolerance against insufficient climate such as high temperature, durable dryness and poor soil and the high product, this plant can play an important role in producing the required forage for herbivorous animals of this province and the similar provinces.

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## MATERIALS AND METHODS

The mentioned study has been performed in Mohsnabad Research Station placed in 10 kms to Mehran with geographical characteristics; longitude 46 16' 34", latitude 33 5' 50" during 2008- 2010.

In this research the different irrigation treatment of dry farming in 7 days once, 15 days once and 30 days once from beginning of July have been studied in the form of complete random block pattern CRBP for some agricultural features of this plant. First the land was ploughed in order to be ready. Then the studied soil has been sampled in depth of 0-30 cm to measure the high and low consumption nutrients of the soil. After plough, the best map of the land is prepared, and each studied curt divided to 2 cultivated rows in space of 2m and length of 16m. The spaces on rows are accounted 2m. The space of each 2 treatment is 2m and that of two main curts is 2 m and distance of each two spaces is 3 m.

The multiplying organs of this study were pads. To perform a successful plantation and to establish sufficient plants and better rooting, 2/3 of pads placed under soil.

Before planting, the manure was used for 100 tones per hectares in order to improve the studied soil. The surrounding of the studied place was fenced in order to protect it from any rodent damage. There was no irrigation after planting until performing the irrigation treatment (from beginning of Khordad). Since it is a new kind of research the exact time of appearance of new air organs and fruits was registered during plant growing. The width and length of pads were measured once per month. In the picking phase, sampling was performed to evaluate the efficiency rate of wet and dry forage. To analyze the data from sampling such as simple and compound variance analysis, the MSTAT-C statistics programs were used. To weigh the average features, the Doken multi-domain test was used, later on after analyzing the data, the effects of the study factors were determined. 3 and 7 days after pad plantation in the field, all the pads were sprayed Carbendasym Iprodyon poison in the proportion of 0.002.

## RESULTS

Viewing variance analysis table of data, it shows that the round irrigation effects on measured features are meaningful in a level of 170 possibilities (table 2). The irrigation treatment of 7, 15, 30 days once performed respectively a dry function of 6.2, 3.67 and 1.65 tones per hectare. The irrigation treatment of 7 days once was in Group A, and treatment of 15 and 30 days once were in Group B and C and dry farming treatment was in Group D. (table 2). In the wet function, the irrigation treatment of 7, 15 and 30 days once made respectively functions of 64.88 35.16 and 16.11 tons per hectare in Groups A, B and C, The dry farming treatment was in Group D too. (table 2). Due to the features of pad numbers over mother pad, the most pad in the irrigation treatment of 7 days once placed in group A with a mean of 15.73. The treatment of 15 days once placed in Group B, whereas the treatment of 30 days once has no meaningful difference from the treatment of 15 days once, so it placed in Group B too. The less number belonged to dry farming treatment (zero) and it placed in Group C (table 2). In the feature of the new pads' number on any pad, the irrigation of 7, 15, 30 days once showed respectively the mean of 2.83, 2.5 and 2.11 and placed in Group A and less number belonged to dry farming treatment and it placed in Group B.

The longest pad belonged the irrigation treatment of 7 days once with a mean of 22.12 cm and placed in Group A. It has no meaningful difference from the treatment of 15 days once with a mean of 20.48. There was no meaningful difference between the treatment 15 and 30 days once.

The less number belonged to the dry farming treatment (because of complete destroy of pads), so it placed in group C. Viewing the width of pad, the irrigation treatment of 7, 15 and 30 days once had respectively the mean of 20.08, 17.95 and 16.20 cm and placed in Groups A, B, C and the dry farming treatment placed in Group D.

## DISCUSSION

Since wet and dry cactuses are affected by total Biomass of plant, total biomass is influenced by the over – irrigation. (Culhaure and Russels *et al.*, 1997). The research of Rodngues and his colleagues showed that the most annual Biomac amount of 220 tons per hectare and dry material 13.9 taros per hectare has been influenced by drop irrigation. Harondezeton and his colleagues reported this amount of 108 biomass and 21 tons per hectare of dry material in 2004. CAM photosynthesis system is a mechanism which reduces the plant evaporation and perspiration CO<sub>2</sub> thick Codicil and low stomata at night. The water storage system allows the CAM plants to forbear the dryness tension period when the accessible water of soil is decreased (Szarek and Ting, 1975; Lyttge, 2004; Smith *et al.*, 1997; Nobel, 1995).

The cultivating species of weak crop pads of *Opuntia* produce pads in the tension situation. This action makes the weak produced pads disappeared (Pimienta- Barrios, 2002) while the wild species don't perform such a mechanism. In fact they avoid protecting new pads in order to prevent the tension. The new produced pads cause more sensitivity in the mother pad against dryness, because these pads contain photosynthetic system C<sub>3</sub> along with the daily open stomas, (Acevedo *et al.* 1983; Osmond, 1978), then they will basically need the water available in the mother pads (Nobel *et al.*, 1994 n. Wang *et al.*, 1997)

In the same circumstance of irrigation the new produced pads create more photosynthesis amount for the mother pad (Gitforf and evans, 1989 wang et al 1997). The number of the produced pads influence seriously on the pure absorption of CO<sub>2</sub>. (Nobel and Harstock, 1984; Pimienta – Borrios et al., 2000)

In the dry situation, the pure absorption amount of CO<sub>2</sub> in the mother pads containing new pad is significantly less than those in the suitable irrigation situation. Furthermore the more number of new pads in the tension situation, the less durability in the plant. The destination rise up (new pads) in forage plant Cactus doesn't result in increasing the photosynthetic capacity of mother pad of the resource – the regular rule available in other plants such as C<sub>3</sub> (Giforf and evans, 1981 , wang et al. , 1997). Using the appropriate amount of water in Cactus causes the efficient absorption of pure CO<sub>2</sub> in day and h\night by combining CAM photosynthetic direction (the mother pad) and C<sub>3</sub> (new pads). Using the appropriate water consumption also causes the plant's Carbon balance (Dodd et al. , 2000) C<sub>3</sub> irrigation causes Cam plants to have the best Carbon transforming chain in water abundance circumstance (Chuhman, 2001). The daily photosynthesis of plants C<sub>3</sub>, C<sub>4</sub> is influenced by water tension from closing the stomas (Chaves, 1991; Yordan, et al. 2000) which it reduces the required CO<sub>2</sub> of mesophil (Waren, 2004 Kilato et al 2003). Since CAM plants have the open stomas during night, they can absorb CO<sub>2</sub> in hot situation and the stressful situation of plants C<sub>3</sub>, C<sub>4</sub> (Pin- Barrios et al. 2002).

**Table 1. Soil Physical and chemical Properties(0-30 cm depth)**

%sand	%silt	%clay	TNV	%Imbibition	Soil texture	P(ppm)	K (ppm)	N%	%C	pH	EC
49	37	14	38	45.5	Loam	6.8	320	21	2.43	7.05	1.69

**Table 2 .Summary of combined analysis of variance for some traits of opuntia ficus indica in cropping seasons.**

S.O.V	df	Pad on mother pad	Pad on pad	Pad Length	Pad Width	Wet yield	Dry yield
rep	2	0.726	0.073	1.009	0.146	3.162	0.28
irrigation	3	119.95**	2.435**	309.349**	110.492**	2297.63**	17.999**
error	6	0.859	0.117	0.755	0.163	6.967	0.069
CV%		12.60	18.82	5.55	4.29	9.03	8.94

\*,\*\* and ns:Significant at the 5%, 1% probability Levels and Non-Significant, respectively.

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